

INSTITUTION OF CIVIL ENGINEERS.

MARCH 12.—The President in the chair.

The discussion upon the knowledge of the properties of the arch possessed by the ancients was renewed on the presentation by Mr. Page of drawings of two arches standing near some cyclopean remains at Cape Crin (Gnidus). There was no positive evidence of the date of these arches; but from their being built without mortar, and the massiveness of their construction, it was agreed that they were probably of the same period as the cyclopean works among which they were situated.

The failure of the Pont de Rotier at Liège, which sunk so much and cracked on the piers to such an extent as to oblige it to be taken down, was fully explained by Mr. Rennie, who presented a drawing of it.

Mr. B. Green also exhibited a design for the proposed stone bridge of eight circular arches for connecting Outhead with New-castle-upon-Tyne at a high level. He also exhibited some beautiful specimens of ornamental bricks made by Mr. Barnes, of Newcastle.

The first paper read was an "Account of the harbour of Pulteney Town" (Wick, Calistone, N. B.).

This harbour was designed by Mr. Telford for the British Fisheries Society in 1803, and the first part of the works executed between 1803 and 1811 by Mr. Burn, at the expense of 16,400*l*. The success of the herring-fishery, and the consequent increase of the shipping frequenting the port, rendered a more extensive harbour essential, and in 1823 other plans, which received the approval of Mr. Telford, were carried into effect by Mr. Brenner.

The various extensions of the works were given in great detail, with the ingenious methods employed in their execution; as also the account of the devastation caused by the sudden inroad of the sea upon the unfinished work of the pier, when 100 feet in length of the pier-head was swept away in one tide, besides the occurrence of much damage to the other parts of the works. The ruined works were secured for the remainder of that year by binding them together with chain-cables, and in the succeeding summer the works were completed and have stood securely ever since. Some interesting observations were made as to the relative action of the waves upon long and short slopes of the sea faces of piers, and the author's experience evidently leads him to prefer a slope of about one to one for works which are exposed to a heavy sea.

The various ingenious methods adopted by the author for conquering the difficulties before him excited great interest, which was kept up by the next paper, also by Mr. Brenner. It was a description of crabs used in building large stones for building sea-walls in deep water.

These crabs, which were strongly built of fir staves humped externally with iron and supported inside by radiating bars like the spokes of a wheel, were used instead of crane-barges for conveying stones of from 30 to 40 tons weight for securing the foot of the sea-walls of Banff harbour, which had failed.

Two of these crabs, of 45 feet cube each, were used to convey stones of 30 tons weight, by passing the two chain-cables which were wound round them through the eyes of the lewis, which were fixed in the stone at low water; at which time the chains being hauled down tight, when the tide flowed, the buoyancy of the crabs floated the stones, and they were towed by a boat over the place where the stone was intended to be deposited; the lashing being cut away the crabs were let go, and the stone fell into its seat. This method was found to succeed perfectly in weather that would have destroyed any crane barge, and the works of Banff harbour were thus secured from further degradation, and were subsequently entirely restored at a comparatively small cost.

A model of Farin's railway switch was exhibited, and its self-acting motion in guiding the carriage into the siding, or on the main line, as required, was shown by the inventor. These switches were stated in have been used on the Grand Junction Railway for some considerable time. The drawings and enlarged diagrams gave fully the details of the method of working.

MARCH 13.—The President in the chair.

In the recapitulation of the conversation of the meeting of March 12, there were read some interesting remarks by Colonel Leafe on the knowledge possessed by the Greeks of the properties of the arch. He contended that numerous examples still existed of their having used it, but that the solidity of their construction, the nature of the materials they employed, and the architectural character of the edifices, which were chiefly temples, the arch was evidently less employed than among the Romans, who used different and less solid materials.

A description was then read of "The Formation of the Town-lands of Mussellburgh, on the Frith of Forth," by Mr. James Hay. This was a curious instance of an extensive tract, of nearly four hundred acres of land, being formed in an alluvial deposit in about three hundred years. The river Esk, when swollen by rain, is stated to bring down quantities of the detritus from the hills, which with the soil washed from the banks of the low lands is arrested when it meets the tide, and is thrown upon the beach: this being mingled with large boulder-stones, becomes fixed, and the sand is blown over it by the heavy north winds, so that the shore is exposed, and thus this large tract has been formed. The diagrams showed the several lines of high water at various dates, and that nearly the entire town is built upon land thus recovered from the sea without the aid of art.

The next paper read was a description of an hydraulic traversing-frame at the Bristol terminus of the Great Western Railway, by Mr. A. J. Dodson, Assoc. Inst. C.E. The action of this machine, the object of which is to transport the railway carriages from the arrival side of the terminus to the departure side, or to any one of several intermediate lines, was thus described:—An opening being made in the train, the apparatus is pushed on to the line of rails, and the carriage required to be moved is run over it, when the frame is quite down, it being then sufficiently low to allow the carriages in pass freely over. As soon as the carriage is brought directly over the apparatus, a man works a pump acting upon four hydraulic presses, which raise the frame until both sides are in contact with the axles of the carriage-wheels, and raise the flange of the wheels clear of the rails: the whole apparatus, with the carriage suspended upon it, is then easily transported to any of the lines of rails, when by unworking a stopper which allows the water to flow back from the presses into its cistern, the carriage is lowered on to the rails, and the apparatus is rolled over ready for recommencing the operation, the whole transit not having occupied more than one minute and a half. The action of the apparatus, which was made by Mr. Napier, York-road, was stated to be very satisfactory, and its cost to have been about £200.

An account was then read of the landslide in the Ashbur cutting on the Great Western Railway, by Mr. J. G. Thomson, Grad. Inst. C.E.

The cutting, which was described, is situated about five miles on the London side of Bath; it was made through a mass of detritus from the neighbouring highlands, consisting of sand, oolitic gravel, vegetable matter, and stones of the great oolite, lying upon the blue lias clay and marl. The whole district was extraordinarily full of water, and appeared to have defied all attempts to drain it. This accumulation of water softened the clay, turning portions into soft mud, and when, by cutting away a portion of the foot, which was situated on a slope, the support was taken away, the whole mass was set in motion, and every attempt to arrest it was fruitless. The details of the attempts at driving water-headings, sinking pits, which collapsed, and were obliged to be filled up with stones and faggots, and all the other engineering devices which were adopted, were given with great minuteness, and being aided by some well-executed drawings, gave an interesting account of a good specimen of one of the difficulties to be encountered by the railway engineer in the ordinary course of his labours. The paper was an example of that which has been so frequently read upon at the meetings of the Institution, viz. the advantage to the civil engineer of a knowledge of geology, by which his progress would be facilitated under such circumstances.

The following papers were announced to be read at the meeting of March 26:—

No. 668. "On Railway Cuttings and Embankments, with an account of some slips in the London clay," by C. H. Gregory, Grad. Inst. C.E.

No. 661. "Account of the Railway from Amsterdam to Rotterdam, and of the principal works upon it," by Dr. Ch. Chevalier F. W. Conrad, M. Inst. C.E., translated from the French by the Secretary.

LECTURES ON ARCHITECTURE AND ANTIQUITIES.*

Lecture II.

TYRE.—There are few cities more celebrated in history than Tyre, and seldom has any one place excited so much controversy concerning its situation. Of its antiquity and greatness there is, however, no doubt. Bishop Newton says—"It was, as is well known, the most celebrated place in the world for its trade and navigation, the seat of commerce, and the centre of riches." The prophet Isaiah says—"Is this your joyous city, whose antiquity is of ancient days?" (xlii. 7.) And in the Book of Joshua we find it spoken of as "the strong city Tyre" (ch. xiv. v. 23). Tyre was a colony or offshoot of Sidon, the ancient capital of the Canaanites, which probably owed its origin as well as its name to Sidon, the eldest son of Canaan. (Gen. x. 15.) By its position on the sea coast, its capability of becoming a leading maritime nation was evident. The soil around it was not inviting for the purposes of agriculture, but, as at hand were the inexhaustible forests of Lebanon, from which the Tyrians built their vessels; and the daring and hardy sailors soon pushed their discovery beyond the pillars of Hercules, founding colonies as they traversed the seas—in particular, Carthage and Cadix may be mentioned. Quintus Curtius says of Tyre—"Coloniae certe ejus pene orbe into diffusus sunt." Early this adventurous spirit, the Tyrians became the carriers of the world; they made Tyre the depot for the merchandise of every quarter of the globe: her ships increased in number; her harbour was excellent, formed by an island in front; and wealth continued to pour in upon her.

The description in Ezekiel conveys a high notion of the prosperity of this great commercial people:—"O thou that art situated at the entry of the sea, which art a merchant of the people for many isles, thus saith the Lord God: O Tyrus, thou hast said, I am of perfect beauty. Thy borders are in the midst of the sea, thy builders have perfected thy beauty. They have made all thy ship-boards of fir-trees of Senir; they have taken cedar from Lebanon to make masts for thee. Of the oak of Bashan have they made thee benches, the company of the Ashurites have made thee benches of ivory, brought out of the isles of Chittim. Fine linen with brocaded work from Egypt was that which thou spreadest forth to be thy sail" (ch. xlv. v. 3 to 7). The prophet next describes the mercenary troops which they employed to protect their city, because the natives were all engaged in maritime pursuits, and then he continues—"Farewell was thy merchant by reason of the multitude of all kind of riches; with silver, iron, tin, and lead, they traded in thy fairs" (v. 12).

If we admit Cadix to be the Berplure Tarshish, the Tartessus and Gades of the ancients, we shall perceive how well situated it was for the purpose of facilitating the trade of the west, and the commerce of the north, abounding with the articles enumerated in the verse just quoted. There is every reason to believe that the tin was supplied from this Cornwall.

The prophet then proceeds to mention places which trafficked with Tyre in their respective products, as in staves, ("persons of men") brass, iron and bloom, horses and mules; Syria supplied fine linen, emerald, coral, and agate; the land of Judah contributed wheat, honey, oil, and balm; Damascus sent wine and wool; Arabia traded in sheep and goats, apices, gold, and precious stones. The prophet Zechariah, speaking of this city, says—"And Tyrus did build herself a strong hold, and heaped up silver as the dust, and fine gold